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ABSTRACT

Presented are study guides for selected aspects of public policy for science and technology, and their impact upon society and public affairs. Each guide includes a topic outline, bibliography, and leading questions. The topics include: (1) Science and Man's Self Image; (2) Science and Social Relationships; and (3) Science, Technology, and Human Values. (SL)

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Science and Social Evolution Implications for Public Policy

A GUIDE TO ADVANCED STUDY

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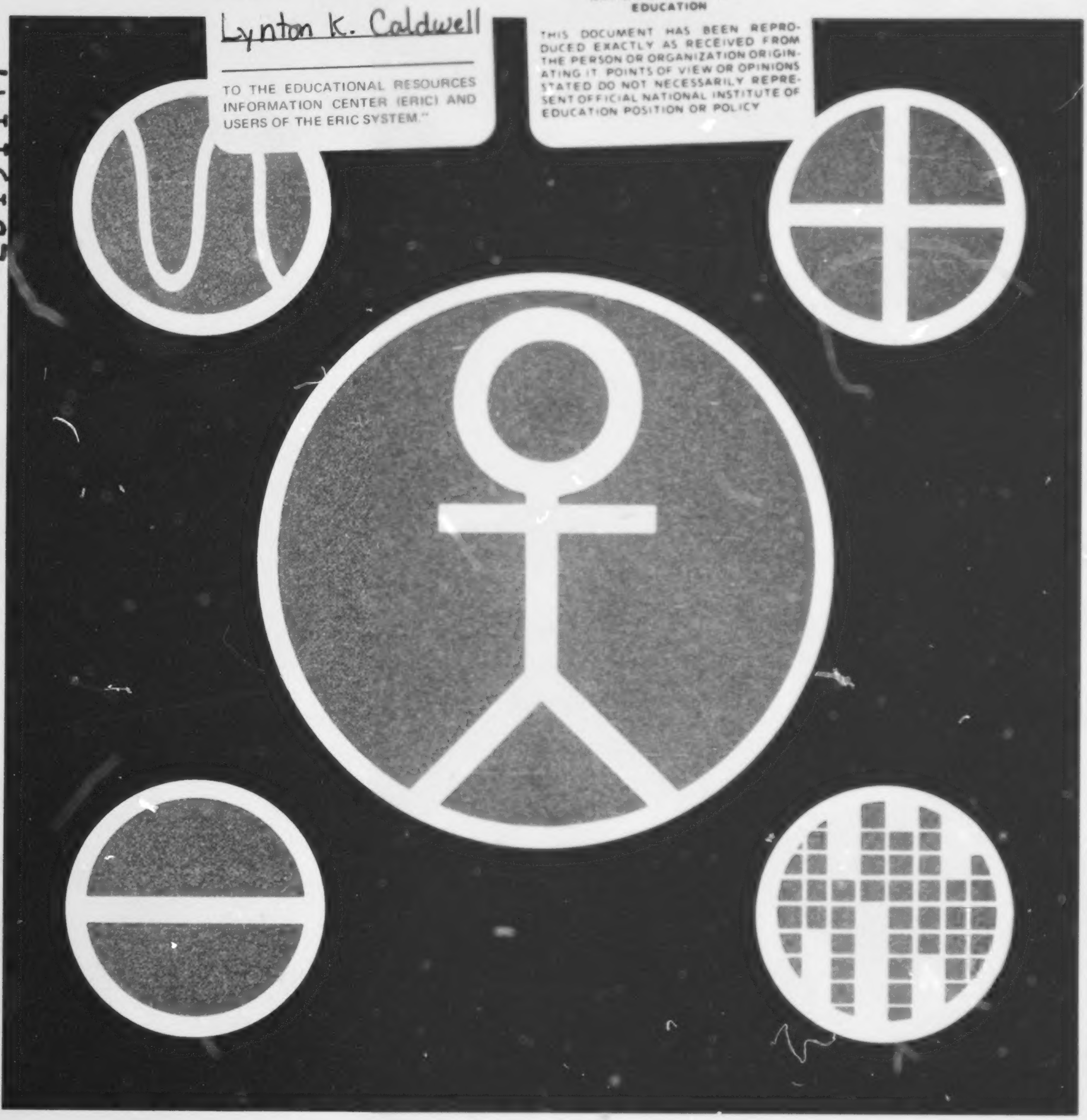

SCIENCE AND SOCIAL EVOLUTION
IMPLICATIONS FOR PUBLIC POLICY
A GUIDE TO ADVANCED STUDY

Interactions of science and technology with major aspects of human experience—physiological, psychological, ecological, economic, esthetic, ethical, and political; interactive and evolutionary impact upon social structures, processes, beliefs, and values, transforming culture and society, changing behaviors, expectations, relationships, and roles, and reshaping public policies, laws, and institutions.

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SCIENCE AND SOCIAL EVOLUTION
IMPLICATIONS FOR PUBLIC POLICY

A Preliminary Statement

The following outlines of topics, questions, and readings are intended as guides to the study of selected aspects of public policy for science and technology, and their impact upon society and public affairs. The emphasis of this volume is upon the roles of science and technology in the evolution of human society, with particular reference to resulting implications for public policy. This material is organized as a course appropriate to graduate or upper-division undergraduate instruction. Its scope is comprehensive and implies a high level of generality if the course were offered in a two-semester or three-quarter academic year. But each of the eleven main topics into which the subject matter has been divided may be studied in depth and detail, and contains sufficient material for intensive study where desired.

The Study Guide was developed over a two-year period, with assistance from the National Science Foundation, and has been revised following six years of experience. It is one of three study guides prepared with NSF assistance, the other two being Science, Technology and Public Policy (revised 1972), and Environmental Policy, Law, and Administration (in two volumes, 1974--Supplement and Index 1976). The instructional purpose which these study guides were intended to assist was experimental, the field of study being relatively new to universities in America or abroad. Outlines of similar or related courses offered in other universities were examined, not necessarily for the purpose of borrowing from or improving upon them but rather to see how other institutions were dealing with the instructional problems of the field.

If there is a one best way to study public policy for science and technology, the authors and revisers of this study guide have not found it. There are many approaches to the field of study. The advantages of some over others appear to depend in large measure upon the character of the institutions offering the instruction, upon the qualifications and interests of the instructors, and upon the needs and backgrounds of the students. This study guide should, therefore, be regarded as a basic instructional facility rather than as a model course. The eleven topics are, in effect, building blocks and can be put together in many different combinations. Individual topics can be taken apart and recombined, the keyed references providing reading lists for the new combinations. The Study Guide is easily adaptable to self-instruction; the topical abstracts, outlines, questions, and keyed references enable the student to follow a systematic course of learning without the direct assistance of textbooks or instructors.

An outgrowth of this development in curriculum construction has been a selective, but comprehensive, annotated bibliography in Science, Technology, and Public Policy prepared under a contract with the National Science Foundation. This three-volume compilation of references, distributed by the Foundation, covers material published in English between, and including, the years 1945 and 1972. Although it has not been updated, it continues to be of assistance to persons working in this field of study.

The field and focus of the study of public policy for science and technology have often been misconstrued. Students in this field are concerned primarily with public policy and, secondarily, with the subject matter of science and technology. They must, to the extent of their interest, become students of social or political science even though their prior training may have been in some other academic field. The study of public policy for science and technology is not intended as an answer to the need for an enlarged and improved public understanding of the substance and methods of the sciences. Efforts to bring understanding of science to college undergraduates, or to citizens generally, could contribute to better public policy for science and technology. But this task involves a different subject matter and focus and, ideally, should be undertaken by the scientists themselves where the subject matter of their own disciplines is taught. In the field of policy studies, the scientists are social scientists, although the assistance of professionals in the physical and biological sciences, medicine, and engineering is also required. As this volume indicates, scientists have been extensively involved in the shaping and criticism of science policy and in the application of science and technology. Scientists do, therefore, contribute to the study of public policy for science and technology even though relatively few of them may ever become actively involved in it as teachers or researchers.

One may concede that the process through which public policy is formulated and applied is an appropriate focus for study and yet question whether there is anything so distinctive about public policy for science and technology as to warrant special attention. It might be argued that the policy process may be studied by political scientists, but that study of the substance of policy belongs to the discipline primarily concerned with the subject matter of policy. For example, this reasoning would leave the study of the substance of weather modification to meteorologists, and of water-pollution control largely to chemists. There can be no objection to this approach, provided that the natural scientist is willing to become a student of the social and political implications of his discipline. But the highly specialized character of modern science makes this interdisciplinary approach improbable unless provided for in programs or curricula designed to further this development.

Understanding of the problems of public policy in any substantive field requires a synthesis of knowledge of both the substance and process of policy. This synthesis can be achieved in several ways. It is possible to achieve it largely because there is available to the student extensive policy-oriented writings by scientists well-grounded in the scientific aspects of policy issues. Synthesis may further result from the various forms of intellectual interchange between students of the processes of public policymaking and administration, and students of the social implications of science and technology. The act of synthesis, however, occurs in individual human minds. In a literal sense, each person makes his own synthesis. Nevertheless, different human minds, addressing the same body of information, may structure their perceptions in similar configurations.

There is obviously extensive agreement among informed people as to the relationships among familiar things. People are more likely to agree on the fact that relationships exist than they are on the qualitative significance of those relationships. For differing value judgments may be imposed upon more generally agreed upon descriptions of reality. This study guide represents the synthesis of a wide and diverse body of data. It is designed to help the student structure his understanding of a complex field of study. But its purpose is to provide a coherent point of departure toward further work in the field rather than to suggest a particular point of view or perception.

A special difficulty in interdisciplinary studies lies in the source material. Literatures of many fields must be drawn upon, but these writings are seldom readily applied to the concerns of the interdisciplinary student or researcher. Moreover, when existing knowledge and literature are restructured on an interdisciplinary scheme, gaps appear where information or documentation is scarce to nonexistent. The interdisciplinary approach opens the way to new areas of inquiry but, meanwhile, the supporting documentation for topics, such as those in the following study guide, is uneven in many respects. The classification of particular writings with particular topics is often very imperfect, but may serve the student better than no points of reference. And this publication is intended as a guide, not as a definitive or comprehensive survey of the fields of study outlined therein. Working from this guide, the student may enlarge and extend his comprehension of the impact of science on social evolution.

The intrinsic importance of science and technology as subjects for policy studies depends upon their significance in the shaping of human societies. The tremendous impact of science and scientific technology on the modern world is now generally recognized. But, until recently, the effects have been widely assumed to be beneficial and to require no special attention. Since 1945, however, the hitherto small stream of critical comment on the uses and effects of science and technology has swollen to Amazonian proportions. Science and technology have become major topics for policy consideration in all industrial societies, in all modern governments, and in international affairs. Dangers of the overuse, underuse, and misuse of science are becoming matters of public concern. And, at long last, universities have begun to recognize their own responsibilities not only for advancing the understanding of science itself, but also for advancing public understanding of its impact upon society. It is not easy to fit the study of public policy for science and technology into the conventional disciplinary structure of universities. But the great importance of the issues with which this aspect of policy study is concerned gives hope that this task, which implies new relationships among the disciplines, will somehow be accomplished.

A NOTE ON THE REVISED VOLUME

This volume is a revision and reorientation of the second of a two-volume syllabus on Science, Technology, and Public Policy originally prepared with the assistance of a grant from the National Science Foundation. This syllabus, in its revised form, now appears as three separate, but related, study guides with the volume numbers dropped. The original Volumes I and II were published by the Department of Political Science at Indiana University.

Bibliographical material has been almost doubled, and the selections for basic readings have been extensively revised. The wording of the title has been changed; study guide being substituted for syllabus, as more descriptive of the character and intended use of these publications.

The major substantive change was the removal of the environmental sections of the old syllabus and their reorganization in a new study guide on environmental policy, law, and administration. Environmental aspects of human social evolution are, of course, treated in this volume under almost every topic. But these environmental relationships are primarily those which humanity has created for itself. The substance of the Study Guide on environmental law, policy, and administration is largely the evolved environment of nature--land, water, air, and living species. This study guide is focused upon the contrived environment of institutions, customs, relationships, and interpretations of behavior. The distinction between this cultural environment and the environment of nature is relative rather than absolute. The differences are largely the consequence of selective emphasis and perspective. The environmental relationships of man in nature are modified, but not annulled, when humanity develops civilizations and lives in the artificial environments of cities.

This contrived environment of humanity has, however, evolved in ways apparently unknown in the nonhuman world. Three elementary factors of major significance to social evolution are evidently lacking, or at best only slightly developed, in the nonhuman world. They are historical consciousness, imagination, and abstract language. These properties of behavior are basic to the development of technology and culture. They make possible the evolution of institutions, of organized administered behavior, and of technology. Social evolution may, therefore, be understood as a process that grows out of nature and into culture.

I

SCIENCE AND MAN'S SELF IMAGE

The most significant consequence of the advancement of science is its effect upon man himself. Science changes the human condition in several respects. It changes man's view of reality and enlarges his vision of possibilities. It enables him to develop new techniques for achieving his purposes, it thereby alters his environment and his perception of that environment and, most importantly, it changes his image of himself. The three topics comprising this section explore the general consequences of man's view of himself as reflected in the mirror of science. Topic 01: Changing Views of Man: The Mirror of Science reviews the findings of science concerning the nature of man and queries what this evidence suggests regarding his social behavior and, especially, his role as citizen and inventor of civic institutions. The remaining topics examine selective aspects of man's self-image and self-understanding in relation to their social and political consequences. Topic 02: Interpretation and Control of Human Behavior draws upon psychology, neurophysiology, genetics, and medicine to obtain insight into the present effects, and probable consequences, of efforts to manage human behavior. Topic 03: Impact of Technological Systems and Automation, drawing on physiology, psychology, sociology, and bioengineering, examines the social problems encountered at the man-machine interface. The advent of automation--the control of machines by machines--and the substitution of computerized techniques for human skills, adds novel factors of uncertain consequences to man-machine relationships. Man's self-image is further complicated by the development of bionic technologies--using inorganic mechanics to simulate, supplement, or substitute for living tissues. It is paradoxical that as knowledge of human behavior and the phenomena of life and intelligence have grown, increasing difficulty has been encountered in defining the nature of man or of obtaining a comprehensive and valid interpretation of the essence of humanity.

TOPIC 01 CHANGING VIEWS OF MAN: THE MIRROR OF SCIENCE

Man appears to be the only creature that can objectify his existence, that can see himself in the perspective of time and place. This self-awareness has been a major factor in the shaping of human societies. But the image that man forms of himself and his environment and condition has been profoundly influenced by the findings of science.

Prior to the technoscientific age, man's self-image was expressed primarily in art, religion, and philosophy. It was easier to idealize or to stereotype man's image when there was no systematic or objective means for testing the validity of subjective interpretations of nature and human nature, and before the enormous complexity of human personality had been demonstrated.

Scientific knowledge has been a destroyer of illusions. It also has revealed possibilities (but not yet limitations) for the improvement of the human species and for the control of human behavior. Not only has science uncovered aspects of human nature that had previously been unrevealed, but it also added immeasurably to the mystery of its place in the universe. Evidence of the evolution of the species undercut unquestioning faith in religious doctrines of deliberate creation. And the prominence of man was vastly diminished against the infinity of the cosmos, as revealed by astronomy and the immense duration of Prehistoric times, as revealed by paleontology. Research in physiology, psychology, and biochemistry raised doubts concerning the basis of social conduct. Was moral turpitude no more than a consequence of biochemical imbalance?

Although man possesses more information about himself than he has ever had before, it is uncertain whether this self-knowledge has added significantly to his social wisdom. Science has not yet provided a picture of the whole man. The man reflected in the mirror of science resembles a cubistic painting suggestive of Picasso. Geometric shapes in assemblage fit together to form a distorted image resembling man; each piece represents a scientific fact, but large areas of the living man are unrepresented. And so it is still possible for the poet or painter to portray an image of the whole man which is as revealing as the one an incomplete science can provide.

This disjunctive and incomplete picture of man may be the root of many of his difficulties in the modern world. It may help to make plausible such abstract concepts as "economic" man or "political" man. The abstract "rational" man has substituted science's imperfect, but "relatively" objective, image for the holistic, but subjective, image of tradition. It is now a task of science to achieve, if it can, an image of the complete man. But it is not certain that science alone can accomplish this task. And it may not be necessary to human welfare that science does so. Were science only to correct the half-truths and misconceptions regarding man and human behavior, that would be an achievement of major significance.

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TOPIC 01 CHANGING VIEWS OF MAN: THE MIRROR OF SCIENCE

TOPICAL OUTLINE	REFERENCE KEY
I. Pre-Scientific or Traditional Views of Man	41, 119, 126, 135, 144
A. Primitive interpretations of human behavior in relation to society and its environment	
1. Coexistence	
a. The personification of natural forces	
b. Animism and totemism	
c. Man as a member of the community of animate nature	
2. Manipulation	
a. Man as magician	
b. Evidence from prehistoric art and anthropology	
c. Magical origins of science and technology	
3. Domination	
a. Man as subduer of nature	
b. Master of other men	
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2. The emergence of tribes and nations--the concept of "a people" and its relationship to "territory"	
3. The emergence of epic, myth, and heroic legend	
4. The position of man in the cosmologies of antiquity--his relationship to the earth and to the gods	
5. The functions of myth and religion as guides to conduct--relationship of their proscriptions to life experience (e.g., food and sex taboos)	
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1. No highly-developed science of man	

2. Images provided by the sciences are partial and reductionist--no single science provides a framework for synthesis
3. Cumulative knowledge provided by the sciences is (as yet) probably inadequate to form a true image of humanity
4. The evidence of science sometimes appears to be inconclusive or contradictory
5. Scientific theory and evidence is often inconsistent or in conflict with popular belief, particularly with political, social, and religious attitudes
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    d. Existential man--self actualization
    e. Mechanistic man--predetermination
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   2. Inadvertent elevation of humanity to the highest creation of nature as a coincident aspect of liberal and democratic ideology

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LEADING QUESTIONS

1. Does man's self-image affect his behavior? How, why, and what is the evidence?

2. What is the role of myth in sustaining human imagery? Is myth obsolete, or does it continue to influence human perception? Has science its own mythology?

3. To what extent may the prevailing self-images of man be deduced from the work of artists--writers, painters, and sculptors? How has science influenced the artist's perception of humanity? (cf. Topic 08)

4. Has the influence of science on man's self-image been largely destructive or constructive? How does its influence compare with myth and religion?

5. What has been the effect of mass-communication media on man's self-image? Has technology, and the industrial society that it makes possible, over-shadowed science and tradition in the shaping of popular imagery?

6. Do advancement of science and its technologies ensure the disappearance of traditional cultures? What kinds of happiness would be possible in a culture-free civilization? Is a "culture-free" civilization a contradiction in terms, or is the "culture" of science a new kind of civilization?

7. Would a purely "scientific" society provide man with a coherent self-image or merely with a summation or composite of scientific findings?

8. What dangers follow from false self-images of man? Would a true image always be safer than a false one? How might truth entail risks? Do the complexities of human personality make any general image valid or useful?

9. Why may the Faust legend be regarded as a parable of the transformation of man by science? What images of man are suggested, for example, by Nietzsche's Zarathustra, Shaw's Man and Superman, Ortega y Gasset's The Revolt of the Masses, Căpek's R.U.R. (Rossum's Universal Robots), and Miller's Death of a Salesman?

10. How does the image of man in the mirror of science differ from the images that appear to exist in the minds of "most men"? How much do we know about the self-images of "most men"? Would greater acceptance of scientific knowledge affect the structure and behavior of society? If so, in what respects?

TOPIC 02 INTERPRETATION AND CONTROL OF HUMAN BEHAVIOR

Implicit in society is a degree of predictable and controlled behavior. Nonhuman societies, of insects for example, have solved the problem of predictable and controlled behavior through genetic programing. Individuality has been sacrificed, but social coordination and cohesion have been immensely reinforced. In contrast to the rigid programed simplicity of the ant colony, societies of men are constantly threatened by the complex, and often contradictory, behavior of human beings. Human individuality is the source of the great artistic and scientific achievements of civilized man. But the perverse aspects of this individuality are the causes of disorder, pain, and conflict in human society.

Since the days of Plato, and apparently much earlier, some men have aspired to control over the behavior of their fellows. Prediction of human behavior has been the purpose of several pseudo-sciences, and has provided occupations for generations of prophets, from primitive soothsayers to contemporary pollsters. As science has piece-by-piece uncovered the basis of human behavior, it has revealed mechanisms by which personality may be controlled. Psychology holds out a temptation of Faustian proportions to seek total understanding of human behavior--knowledge that might perhaps be turned to total control.

Scientific control of personality, although yet far removed from perfection, has already become good enough to create social, legal, and ethical problems. Not the least of these are the dangers of political abuse of scientific knowledge through thought-control and the manipulation of emotions for political purposes. Science fiction widely depicts a dismal future for human individuality and personal freedom in a world regimented through the power of psychotechnology. But technologies of personality change may also hold possibilities for alleviation of behavioral disorders now associated with mental illness and crime, and may offer more humane alternatives for criminal justice.

The dangers implicit in the advancement of the psycho-sciences lie less in their findings per se than in the use to which these findings are put. One of the tasks of government is to control the use of this knowledge of human behavior to prevent its abuse, especially by government itself. Although scarcely perceived as a public issue at the present time, the control of human behavior through personality manipulation will before long become a major concern of politics and ethics. It will doubtless be a public issue in the twenty-first century. In a political system based upon the collective judgment of individuals, the ability of the individual to play his civic role in an informed and responsible manner is of highest importance. The impact of science and technology upon the prediction and control of human behavior is therefore a major area of concern in the study of service and public policy and in the political science of self-government.

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TOPIC 02 INTERPRETATION AND CONTROL OF HUMAN BEHAVIOR

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LEADING QUESTIONS

1. Can the traditional concepts of responsibility and duty, reward and punishment, be applied to cases in which the individual's behavior is controlled, as in the "Brainwashing" of soldiers or political prisoners?

2. In what fields of science have the greatest advances occurred during the past half-century in the prediction and control of human behavior? What are these advances and what do they imply regarding social evolution?

3. Are the possibilities of creating a more humane society worth the risks? Could the risks be minimized? How?

4. A seemingly logical objection to a science of behavior is the statement that 'The behavior required in understanding one's own behavior must be something beyond the behavior which is understood.' Does this argument carry any force? Why? Is there a methodological way around this problem?

5. What meanings can be assigned to the statement that human behavior is determined? Does recent progress in the fields of psychology, sociology, and psychiatry have any bearing on the old philosophical argument of free will versus determinism? How should causation of behavior be defined?

6. How would you analyze the probability of propositions involving predictions about the behavior of large groups? Can inferences about the behavior of particular individuals be made on the basis of statistical predictions?

7. It has been suggested that in a future state of society, with little challenge and useful employment for the mass of people, the widespread administration of tranquilizers and sedatives might be necessary. What does this suggest with respect (a) to human personality and (b) to political and social trends?

8. What are the probable limits to the compulsory alteration of personality in an open and relatively free society? Is the proposition ethically or legally more difficult than imprisonment, hospitalization, or capital punishment?

9. Does our present use of I.Q. and personality tests represent, in fact, an effort to selectively shape the dominant personality characteristics of our society?

10. Can the old concept of the individual's "free will" be interpreted meaningfully in a society in which the social sciences are demonstrating increasingly greater powers of explanation, prediction, and control of human behavior?

TOPIC 03 IMPACT OF TECHNOLOGICAL SYSTEMS AND AUTOMATION

Of all the tools that man has invented, the machine has been the most portentous. The dictionary describes the machine as "an apparatus consisting of interrelated parts with separate functions which is used in the performance of some kind of work." In the pre-automotive age this might very well serve as an abstract description of a horse. The critical difference between organism and machine appears to be that one lives and the other does not. Both systems require external energy to function; coordinative mechanisms are essential to their performance. More significantly, the machine is an artifact of man and is moreover an extension of himself. Even under automation where machines control other machines--and may even "manufacture" other machines or replicate themselves--it is man who provides their design and whose purposes they serve. Machines do not exist apart from man--the autonomous machine may be possible, but has not yet appeared.

The machine is the most apparent material product of science and technology, and assessment of its social impact implies examination of its systemic relationship to human society. Social policy with respect to the machine is really concerned with the bio-machine interface. Man-machine relationships have given rise to new fields of scientific and technological study. Industrial psychology, bioengineering, bioinstrumentation, bionics, biophysics, and cybernetics are fields of inquiry concerned with or strongly influenced by relationships between man and machines. Topic 02 treated man's ambition to achieve perfect control over human behavior. But engineers have sought a simpler more easily controlled perfection in the robot--an artificial simulacrum of the obedient human servant.

Where does man end and machine begin? Man projects his energy and his thoughts into machines, most significantly into computers that simulate the neural processes that human intelligence can begin but lacks sufficient capacity to complete. Scholars seriously debate the prospect of machines that think or, more complexly, that have properties to which the term consciousness can be applied. And does man become part-machine when fitted with artificial limbs, a "pacemaker" regulator for his heart, or with artificial veins or internal organs? Exploration of the bio-machine interface forces man to a more fundamental examination of the essence of humanity.

There are also social interactions at the man-machine interface. Machine production, and especially automation, changes the traditional nature of work, and influences social structure and behavior. A large part of the social and economic legislation of the past century has resulted directly from the advent of machines, factories, and the mass production and distribution of goods and services made possible by machines. Understanding of the effect of machines upon individual man and upon human society necessarily precedes the reshaping of institutions, practices, and technologies to permit the advantages of machines to be obtained without inordinate or unnecessary social, ecological, or esthetic costs.

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TOPIC 03 IMPACT OF TECHNOLOGICAL SYSTEMS AND AUTOMATION

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LEADING QUESTIONS

1. Is there an irreconcilable incompatibility or conflict between man-machine systems and human personality? What practical significance if any, follows from the teleological or purposeful orientation of machines and the assumed nonteleological evolutionary origin of man?

2. How has the phrase "the human use of human beings" been used as a justification for man-machine and automated systems? Is the use valid?

3. How does research into automobile or airplane safety throw light on the problems of constructing and maintaining man-machine systems?

4. What specific conditions would have to prevail in order to ensure the control of machine technology for human welfare? What have been the principal obstacles to the establishment of these conditions?

5. What is the general thesis of Jacques Ellul concerning the impact of technology on human society? How does his interpretation of technology compare with those of Giedion, Mumford, and Weiner?

6. What are the differences between biophysics, bionics, biotechnology, and bioengineering? Between cybernetics and automation?

7. Is it theoretically possible to eliminate failures in technological systems? If so, would there be resulting disadvantages?

8. Why have mechanistic and deterministic theories of human behavior been attractive to some social theorists and reformers? What concepts of personality are most opposed to mechanistic or deterministic theories? What arguments support anti-deterministic views?

9. To what extent, and in what ways, have technological and systems modes of thinking influenced other aspects of thought and culture? Has these effects been generally beneficial?

10. Beginning de novo, how would you organize government to cope with the challenge and opportunities implicit in machine technology?

II

SCIENCE AND SOCIAL RELATIONSHIPS

The topics in Part II relate to the ways in which science and science-based technology have influenced relationships among people and between people and their environments. Five aspects of the social impact of science are considered. Topic 04 deals with *Quantities and Qualities of Human Populations*. The focus here is on the relationship of science to the enormous increase in world populations and to the implications of that increase. Topic 05: *Biopolitical Relationships: Man and The Biosphere* logically follows, emphasizing the influence of biological science upon human beliefs and behavior, especially in relation to the planetary life-support system--the Biosphere. Topic 06: *Sociology of Knowledge: The Expanding Nöosphere* is concerned with information, especially scientific and technical information as social influences. It also deals with knowledge as an evolutionary force transcending particular individuals or generations. Topic 07: *Science Fiction: Utopias, Criticism, and Conjecture* surveys perceptions of the human condition and its future as it is affected by science and technology. The focus is upon science fiction as social criticism and conjecture, and the advancement of social theory through projected utopias "good" and "bad". Topic 08: *Esthetic Experience: Concepts, Media, Techniques* deals with the roles of science and technology in the several realms of artistic expression (e.g., painting, sculpture, music, architecture, and poetry). It concerns the changes in artistic perception brought about by science and the changes in art forms, media, and technique resulting from technoscientific innovation (e.g., acoustics, plastics, computers, etc.). The theme unifying these topics is the way in which their impact upon social relationships has been mediated by science concepts and science-based technologies.

TOPIC 04 QUANTITIES AND QUALITIES OF HUMAN POPULATIONS

The substance of the foregoing topics makes it clear that man as a species has long nurtured the belief in his own perfectibility. Greek heroes were "magnified" by the gods, and Christian and Buddhist "saints" sought individual perfection through good works and meditation. During the intellectual and political revolutions of the 18th and 20th Centuries, men sought perfection for society through education and political control. But none of these efforts was based on a science of human development or behavior. Most modern political systems, notably democracy and socialism, have been based upon assumptions of universal perfectibility and a moral imperative for equality among all individuals. But there are obvious contradictions between these beliefs and the actual states of societies. Moreover, scientific inquiry has been improving in its capability for analyzing and predicting population trends. It has become clear that the behavior of a given population (gene pool) cannot invariably be deduced from the behavior of particular individuals in the population.

Science, moreover, has been capable of improving the physical quality of man through knowledge of nutrition, sanitation, dentistry, and medicine. Civilized man in the 20th Century can live longer and be healthier and more comfortable than his forebears in earlier centuries. By improving man's chances for survival, however, science has inadvertently contributed to one of the great social problems of the modern world, for which science, hopefully, can provide a humane solution--e.g., the problem of overpopulation. Through control of disease and improved food supply, science set the stage for the exponential increases in human populations that became evident in the 20th Century. The global ecosystem was jeopardized because science had intervened at the death end of life's spectrum and had facilitated the multiplication of population at the birth end. Religious, moral, and political prejudice, and lack of a suitable contraceptive technology, delayed any serious attack on growing population imbalances until the very recent past.

Even though contraceptive technology has now become relatively reliable, few nations possess a satisfactory and effective system of population control. The alternative to a rational and humane system may be an arbitrary, and probably violent, reshaping of society by an elite with sufficient wit and skill to command the power of technoscience and impose order and purpose on a people that have blundered into ecological bankruptcy. It is all too probable that a major problem for science, technology, and public policy in the decades ahead will be how to deal with nations whose populations reach the point of saturation, stressing their ecosystem beyond its capacity to sustain the people or to restore its own capabilities. Until modern society is able to bring the problem of numbers under control, its ability to deal effectively with problems of human quality will be severely constrained.

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TOPIC 04 QUANTITIES AND QUALITIES OF HUMAN POPULATIONS

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III. Some Long-Range Implications of the Technical Feasibility of Control Over the Quantities and Qualities of Human Populations	27, 79
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1. A level of public acceptance of the desirability of population control is necessary to technical implementation	
a. "Critical mass" unknown, but a large majority is not an apparent necessity	
b. Issue of the "right to procreate" requires reeximation	
c. Heterogeneity of population complicates acceptance (e.g., racial, religious, ethnic competition)	150
2. Population policy on a national or public basis is requisite to effective results	
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C. Public population control policy--comprehensively conceived and eugenically oriented--unlikely in the near future except under conditions of duress	229, 257, 261, 298
1. Voluntary and public compulsory control most likely under conditions of mass starvation or intolerable crowding	
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3. Highly automated society might elect a control policy substituting power of machines for numbers of men	
4. Control might result from a science-based, ecological, political ideology responding to progressis of future disaster	
D. Ethical aspects of population policy (cf. II, E, Genetics and eugenics)	27, 64, 71, 93, 111, 143

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LEADING QUESTIONS

1. What accounts for the noticeable shift in political attitudes toward population control during the last decade? Are governments leading or following public opinion?

2. Viewed from the perspective of science, have the effects of "morality" tended toward improving or depressing the quality of life? Specifically, what have been the effects of morality upon human relations involving differences of sex, race, intellectual traits, and physical skills?

3. Have changes in science and technology changed the requirements of governments for military manpower? If so, in what ways?

4. Do contradictions in popular attitudes toward sex and the family, and toward peace, war, the environment, and the economy have any prognostic value for national population policy in the future? Are racial or ethnic factors likely to be more obstructive than moral or religious factors in population planning?

5. Why have the limits of population growth so frequently been considered solely upon the basis of food supply? What effect, if any, have the findings of ethologists and ecologists had upon the numbers debate?

6. To what extent does public law in the United States permit eugenic policies to be put into effect? Does society have "genetic" rights different from and superior to the "civil" rights of individuals or groups?

7. Could a positive program of numbers control or of eugenic selection be implemented in a democratic society? If so, how?

8. In view of the probable effects of science and biomedical technology on conception control, sex-connected disease, and the chronology of sexual maturity and instinctual motivation, should the so-called sex-morality laws on state statute books be summarily scrapped? Should new legislation be substituted, and to what purpose?

9. What would be some of the effects of a world situation in which some nations control population and others do not? Is population control feasible in societies based on the expectation of war?

10. What would be the elements of a rational population policy for the United States and how could they be implemented?

TOPIC 05 BIOPOLITICAL RELATIONSHIPS: MAN AND THE BIOSPHERE

This topic follows logically from that preceding on Quantities and Qualities of Human Populations. Topic 05, however, emphasizes the influence of science upon interactions between human society and its environment. This emphasis is biopolitical rather than biosociological because its focus is not only upon relationships, attitudes, and institutions, but especially upon the activities and objectives of human society in relation to its environment. Political theories and institutions have, moreover, been influenced by analogies between biological systems (e.g., the human body) and social systems. There is a substantial literature on organismic nature of the state. Much of the earlier theorizing was based upon assumed structural similarities, but more recent biopolitical scholarship has sought clues to human political behavior in the psycho-physiological properties of human personality. Some theorists see human society as a recent stage in a growing complexity of systems. From this viewpoint, societies evolve in a hierarchy of systems and are a part of, and in continuous interaction with, their total environment.

Two questions are implicit in this approach to the Topic: First, what has been learned about humanity that explains its behavior in relation to its environment, natural or contrived? and, second, what environmental relationships have evolved as aspects of human culture and how has science influenced this evolution? Science has begun to make explicit relationships that have neither been evident nor properly understood. Knowledge of the true nature of these relationships has opened new areas of public concern and political action. The environmental movement of the Nineteen Sixties and Seventies has been a consequence.

The relationship between human society and its external environment is, in significant terms, a two-way relationship. Environmental influences on human genetics, physiology, and behavior are as significant as the human impact on the environment, and are often linked in reciprocal or cybernetic relationships. These relationships were often sensed, if not fully understood, in primitive and traditional societies. The initial impact of science was ostensibly to free mankind from bondage to the natural world and to enable humanity, through technology, to remake the world to human specifications. But the results of this liberation have been mixed, and science has now been invoked to help society to correct, where possible, past environmental errors and avoid mistakes in the future. The liberation of humanity from nature is now best understood as "conditional" and dependent upon respect for the basic conditions enabling life to exist upon the Earth.

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TOPIC 05 BIOPOLITICAL RELATIONSHIPS: MAN AND THE BIOSPHERE

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b. Naturalists and scientists	
c. Establishment and development of museums, botantical and zoological gardens and natural area reservations	
4. Impact of evolutionary and ecological concepts (Note again I, The Natural Context of Human Behavior)	34, 48, 121, 124, 133, 134, 136

- a. Evolutionist theories of Darwin, Russell, Huxley, and Haeckel
- b. Expanding horizons of biological sciences
  - (1) Physiology
  - (2) Paleontology
  - (3) Comparative anatomy
  - (4) Genetics
  - (5) Ecology
- c. Reactions of social theories to evolutionary and ecological concepts
  - (1) Acceptance––Herbert Spencer, Auguste Comte, and William G. Summer, "Social Darwinists"
  - (2) Rejection––Religious fundamentalists, Utopian socialists, and humanists
- d. Growth of movements for nature protection on the conservation of natural resources and species — 64, 170, 221

5. Formulation of the idea of the biosphere — 221
   - a. V. I. Vernadski, La Biosphère, 1926/1929
   - b. P. Teilhard de Chardin, Le Phenomena Humain, 1968
   - c. Biosphere Conference, Paris 1968
   - d. United Nations Conference on the Human Environment, Stockholm 1972

III. Bases of Human Social Behavior: Biosociology — 3, 66, 95, 112, 113, 114, 157, 210, 232, 260

- A. Controversial character of social theories based upon, or heavily influenced by, biological concepts — 132
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    - a. Religious (Judaic-Christian) objections based upon belief in unique creations and Scriptural literalism
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        (1) Humanist belief in the infinite perfectibility of mankind and the dominant role of institutions (i.e., environment) in shaping human character and behavior
        (2) Social democracy and especially Marxist ideology committed to reformation of human society through indoctrination and institutional change

2. Scientist and scientific reservations 232
    a. Objections by many social scientists and some biologists (reflecting subjective preferences more often than a weighing of scientific evidence)
        (1) Analogies between biological and social science are irrelevant and misleading
        (2) Human social behavior can be satisfactorily explained (and controlled) without recourse to biological causation
        (3) Because of the foregoing objections, biological interpretations are invalid, socially undesirable, morally degrading, and dangerous to democratic (or socialist) beliefs and institutions
        (4) Biological explanations, even if valid in some respects, are too susceptible to abuse to be socially or scientifically acceptable
    b. Present understanding of human behavior and development insufficient to establish clearly the role of biology (i.e., genetics, evolution, and ecological interactions) in human society
    c. Complexity of human physiology and psychology presents great difficulty in ascertaining behavioral reactions to a broad range of biological influences, even when relevant factors appear to have been identified

d. Biological evidence has not explained the cultural evolution of human society --a superorganic state of existence must be assumed

e. Research methods and strategies not yet adequate to resolve the foregoing difficulties

(1) Systems approach holds promise but yet insufficiently developed

(2) Multidisciplinary investigation necessary, but difficult to organize

(3) Funding difficult to obtain because of political and academic objections, to the possible outcomes of the inquiries

3. Political objections to biosocial concepts (in addition to the foregoing)

a. Politically divisive

b. Extenuate or excuse "anti-social" behavior

c. Encourage "elitist" and "racist" ideologies

d. Have no practical value in solving social problems of direct concern to politicians generally

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   a. Biological factors and analogies are examined not to wholly explain behavior, but to provide understandings without which behavior cannot wholly be explained
   b. Distinction between biology and culture is not sharply drawn 1, 3, 5
      (1) Other animals evidence behaviors suggestive of rudiments of culture
      (2) Man is understood as a culture-creating animal (i.e., tool making and city building are "natural" to humans)
      (3) Man's cultural limitations may be biologically defined (i.e., limited environmental tolerances and innate capabilities)
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   8. Zero Population Growth
   9. Carcinogens in Food and Drugs
   10. Genocide and the United Nations
   11. Eugenics, Sterilization, and Human Rights

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TOPIC 06 SOCIOLOGY OF KNOWLEDGE: THE EXPANDING NÖOSPHERE

Knowledge is the conserver and disrupter of culture. It is a perishable commodity which, unless preserved, must be recreated with each new generation of men. Although the informational content of knowledge can be recorded in various forms, from clay tablets to computer memory systems, knowledge itself exists only to the extent that there are knowers. Yet, paradoxically, a latent state of knowledge may be independent of any specific individual or group. Pierre Teilhard de Chardin has postulated a "nöosphere," or state of knowledge, that, in a metaphysical sense, can be perceived as separate from man himself, "...an ever more highly organized consciousness of the universe...."

The word "science" is sometimes used as descriptive of the extant body of validated knowledge, and it sometimes refers to the method by which reliable knowledge is discovered. But there are forms of knowledge to which the term science, or its synonyms, do not apply. Much traditional knowledge or folk-wisdom is of this character. Traditional or intuitive knowledge forms a large part of the content of the so-called humanities. Scientific knowledge, derived from verified evidence, has often contradicted traditional knowledge and has created social tensions. The exponential expansion of knowledge in the 20th Century has been a major causal factor in social instability and conflict. Knowledge, even more than in the past, has become a source of power requiring wisdom in its use if unwanted inadvertencies are to be avoided. Knowledge has today become too important to leave solely to its professional custodians, the scholars. Now, and in the future, it must be a major public concern of socially-responsible leadership.

In the technoscientific society, the management of knowledge becomes a major--perhaps the major--industry. New, large, and complex organizations and technologies have been developed to maintain and develop the knowledge system. Among them are libraries, data banks, museums, many kinds of schools and universities, research institutes, and the publishing and electronic communications industries. The large volume, and often transient character, of information requires new operational technologies for its retention, retrieval, and removal when obsolete. The importance of knowledge has necessitated the study of how knowledge is discovered, stored, transmitted, and retrieved. A new field of learning, zetetics, or the science of inquiry, has been proposed. The increasing dependence of advanced societies on vast quantities of specialized and rapidly changing knowledge seems certain to affect the future structure of society, of government, and of systems of information and education. The wealth and power of nations are now absolutely dependent upon their resources of knowledge which, of course, include technical skills. The propagation and management of knowledge must henceforth be a major facet of public policy in all scientifically-advanced countries.

Criteria for the management of knowledge thus becomes a critical issue of policy. Because knowledge is almost never neutral in its effects and may have far-reaching and unexpected impacts upon social relationships, the sociology and ethics of knowledge deserve more attention than they have as yet received.

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TOPIC 06 SOCIOLOGY OF KNOWLEDGE: THE EXPANDING NÖOSPHERE

TOPICAL OUTLINE	REFERENCE KEY
I. Definitional and Relational Aspects of Knowledge and Information	27, 44, 60, 84, 98, 101, 102
A. Knowledge implies understanding or comprehension, more than mere data but less than wisdom	
B. Information implies data, fact or message, but does not necessarily imply interpretation or understanding	
C. Intelligence implies ability to know and to reason, but also denotes certain types of knowledge-producing information	
D. Foregoing terms are not sharply distinguishable and interrelate in complex ways	
II. Knowledge as a Social Force	133, 150, 184
A. Knowledge as the substance of culture	1, 12, 49, 91, 133, 152, 162
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4. Liberating and revolutionary character of scientific knowledge	49, 71
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LEADING QUESTIONS

1. Technologist R. Buckminster Fuller has described his concept of wealth "as consisting exclusively of integrated intellect and energy," (Saturday Review, April 1, 1967, p. 17). Is this a plausible proposition and why?

2. It has been alleged that only in modern society have people been employed merely to learn. Is this substantially true and, if so, why was it not done before and why is it being done now?

3. Does the concept "nöosphere" have more than a symbolic or metaphysical significance? How is it distinguishable from the ideomass?

4. What guidelines are available to help a society determine how much it should invest in knowledge production? Are there criteria for estimating the social value of knowledge?

5. Herbert Marshall McLuhan has built a thesis regarding the significance of communications media in modern society around the phrase: "the medium is the message." Does the character of the medium affect the nature of the information conveyed, or is it primarily the "side-effects" of the medium that make the differences?

6. How is the growth of information changing the organization and functions of libraries? How are these changes related to the growth of information services on a subscription or tax-supported basis?

7. What is meant by the expression "knowledge as a commodity"? Why is knowledge production and distribution now being described as an industry whereas, formerly, the process of learning was considered largely unrelated to commerce and industry?

8. Does the mere existence of knowledge create a pressure for action? What kinds of knowledge are action-inducing? Does threatening knowledge tend to stimulate counter-knowledge? If so, give examples.

9. Van Rensselaer Potter has identified certain kinds of knowledge as "dangerous" (Science, November 20, 1964). Is the danger in knowledge or in men?

10. Does the importance of knowledge in the present world have implications for social and political organization? How might differences in intellectual capacities among men affect the situation if the differences became much greater than they now are?

TOPIC 07 SCIENCE FICTION: UTOPIAS, CRITICISM, AND CONJECTURE

Modern science grew out of a cultural milieu in which historical perspective was highly developed. In this perspective, the present was perceived as the future of the past, and the future was seen as the unfolding of past and present. It is therefore characteristic of science-oriented individuals in modern society to perceive the future as history, and time as irreversible rather than as cyclical.

Philosophers of history, of whom Marx, Spengler, and Toynbee are representative, have undertaken to place modern man on a historical trajectory extending from the past to a future state. But these philosophical projections have relied heavily upon historical and metaphysical determinism in forecasting man's destiny. Now, however, the growth of science, and of its power for prediction, have begun to provide an empirical foundation for foresight. In consequence, science is increasingly viewed as enlarging man's power to shape the future. But the actual way in which science will transform the world, and the resulting implications for man's future, remain largely conjectural.

The future remains conjectural because the predictive power of science is, as yet, severely limited. Moreover, what may be technically possible through science may be frustrated by cultural obstacles--economic, political, or ethical. It is not "scientific" to speculate beyond demonstrable evidence. Forecasts of the future effects of science can, therefore, seldom be reported as scientific evidence. Fascination with the transforming power of science, and uncertainty regarding man's capacity to control its demiurgic forces have induced a literature of conjecture regarding the effects of science on man's future.

This literature is utopian in the sense that it describes states that do not now exist, but are believed to be possible. It frequently projects or epitomizes idealized states or conditions that are the perceived outcomes of present or hypothesized uses of science and technology. These outcomes would not necessarily be seen as agreeable by most readers. Indeed, many science utopias have the quality of nightmares. Some of these, suggestive of medieval morality plays, are intended as warnings against the misuse of science. Although a large part of science fiction is mainly entertainment, there is also, in much of it, a strong element of social criticism. The hopes and fears of contemporary man regarding the future of his species have thus found expression in a wide-range of science fiction and utopian literature.

The social criticism in these writings is often covertly aimed at present policies that are perceived as having disastrous consequences, as in the perversion of science for military purposes. It is difficult to assess the full significance of this literature, but it clearly represents an "underground" of critical comment on public policy for science and technology and presages latent issues that may rise to the surface of overt political action in the future. By projecting possibilities, the conjectural literature of science and technology may influence public action to attain or to avoid them. Brave New World, 1984, and Walden Two illustrate fictions which many thoughtful people fear that society, through science, may bring into reality.

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TOPIC 07 SCIENCE FICTION: UTOPIAS, CRITICISM, AND CONJECTURE

TOPICAL OUTLINE	REFERENCE KEY
I. Three Forms of Speculative Literature May Be Distinguished	
A. Utopias (ideal societies or their opposites, now often called "dystopias")	21, 86, 108, 109
B. Science fiction and fantasy	67, 72, 75, 112, 115
C. Science-based conjectures regarding the future of man and society	4, 38, 77, 78, 104
II. Utopias	
A. Name derived from More's classic work of 1516	13, 87, 94, 96, 98, 105
B. Common characteristics	73, 87, 97, 102, 109
1. Describes a nonexistent "ideal" state or community	
a. The community may be a fictional description of a conjectured new social system as in Bacon's *New Atlantis*	
b. The community may be a more or less thinly disguised portrayal of an existing community or nation for purposes of criticism or satire, as in Swift's satires, Bellamy's *Looking Backward*, or Orwell's *1984* (cf. IV, B)	14, 88
2. Scope is usually the total character of the society, including its environment	
3. Describes the relationships between the individual, society, and the state	
4. Science or innovation is especially prominent in utopian literature––to explain how the transition from the present to the idealized state occurred	1, 9, 15
5. Utopias are based on the realization of an ideal set of social values, ordered in terms of the author's conception of their primacy	1, 6, 24, 39, 52, 103

a. The values may be set forth explicitly, as in Plato's Republic

b. Satirical or critical utopias often leave the author's intended ideal values unstated, but implicit in the context of the work

6. A special, but increasingly frequent, type of utopia (sometimes called dystopia) whether a critique of an existing social order or a grim extrapolation of possible trends, pictures a society in which the order of primacy of human values has gone awry (e.g., H. G. Wells) — 8, 9, 27, 37, 54, 64, 95, 118

7. Ideas or concepts more important than characterization--situations and relationships more significant than individual personalities that are seldom fully developed

C. Classic examples of the long history of utopian and semi-utopian literature
   1. Plato, The Republic
   2. More, Sir Thomas, De Optimo Reipublicae
   3. Bacon, Francis, The New Atlantis
   4. Campanella, Tommaso, The City of the Sun
   5. Owen, Robert, The Future of the Human Race
   6. Swift, Jonathan, Gulliver's Travels
   7. Butler, Samuel, Erewhon
   8. Bellamy, Edward, Looking Backward
   9. Wells, H.G., A Modern Utopia
   10. Huxley, Aldous, Brave New World
   11. Orwell, George, 1984
   12. Skinner, B.F., Walden Two

D. Areas of difference in the above list
   1. Form--novel (Huxley); philosophical statement of the ideal state (Plato); satire (Swift); romance (Bellamy)
   2. Author's point of view (e.g., satire vs. the ideal)—the model state (utopia)—e.g., More, Bacon, Bellamy; disapproval (dystopia)—e.g., Butler, Huxley, Orwell
   3. Role of scientific and technological innovation in creating the new state--little or none (e.g., Plato, More); important (e.g., Bacon, Huxley, Skinner)

III. Science Fiction (Utopian and Non-Utopian)	56, 65, 66, 69, 75, 76
A. Some literary types and utopian or conjectural themes	
1. The wonderful journey--including space travel	73, 92, 110
2. Inventions in general (e.g., Hertzka's Freelandia, in which economic growth depends upon largely unspecified new technology)	15, 29, 59, 83 102
3. Inventions based upon new principles (e.g., H.G. Wells' Time Machine)	
4. Concern with ecology and natural resources (e.g., agriculture, minerals, power, etc.; e.g., Bacon's New Atlantis, Herbert's Dune)	
5. Inventions concerned with transportation (e.g., Tom Swift's electric car, rockets, and Jules Verne's "Nautilus")	
6. Inventions concerned with communication (e.g., Bacon's "means to convey sound" in New Atlantis)	
7. Discoveries concerned with biological development and medicine (e.g., plasticity of living forms in Wells' Island of Dr. Moreau)	17, 52, 85
8. Psychological theories (e.g., B.F. Skinner's Walden Two)	95
9. Discoveries and inventions providing economy and convenience (e.g., Bacon's New Atlantis, and automation in Bulwer-Lytton's The Coming Race)	
10. Inventions concerned with warfare (e.g., airplanes in Wells' The War in the Air; submarines and space vehicles in novels by Jules Verne)	
11. Social invention--new forms of society (e.g., Zamiatin's We, and Le Guin's The Dispossessed)	
12. Fantasy (e.g., Edgar Rice Burroughs)	
B. Continuity of this literary genre and overlapping of classification with science-based utopias	89, 94, 95, 97

IV. Uses of Science and Technology in Literature	72
A. Utopias (including negative utopias)	16, 21, 87, 102
1. To transform familiar elements into a striking and novel setting, for emphasis	
2. To suspend disbelief, as in science fiction, by presenting a plausible background	
3. As necessary for the realization or the existence of the postulated society, as in *Freelandia* or *Dune*	88
4. As a major plot element in which the development and use of science and technology is a significant force for good or evil (e.g., Hoyle's *Ossian's Ride*)	1, 87, 117
B. Science fiction and fantasy	2, 75, 82, 84, 103
1. To criticize or saturize social institutions or behavior	18, 37, 41, 44, 83, 101
2. To entertain the reader with novel ideas or delightful gadgets	
3. To extrapolate possible futures, as in H. G. Wells' use of the ideas of the thermodynamic death of the earth and the sun, and T. H. Huxley's pessimism concerning the future evolution of man	10, 11, 12, 25, 32, 70, 77, 79
4. To extrapolate future states of science and technology, including their dependence upon and 'fit' in society	4
5. To postulate and examine possible effects of present or future science and technology on man, his institutions, and his values	15, 80
C. Nonfictional conjectures about the future man and society--futurology	54
1. Although the fictional vehicle has not been used, science and technology may be used in all the ways specified in A and B above	2, 15, 16, 43
2. Increasing importance seems to have been given recently to studies of the future influence of science and technology on man and society (as distinguished from technological forecasting as such)	

V. Influences of Science Utopias and Science Fiction	23
A. In general, this literature may serve the historian as a valuable index to contemporary popular (or individual) concepts of the	20
1. State and nature of science and technology	9, 26, 89, 104
2. Relationship of science and technology to social activities and institutions (e.g., commerce, medicine, housing, etc.)	81
3. Relationship of science and technology to social values and goals	1, 23, 41, 61, 68
B. In the United States during the nineteenth century	2, 6, 63, 74, 89, 111
1. Throughout the Century, and especially toward its end, there was a romantic interest in science and technology	
2. Almost every major American writer of fiction (and most of the second rank) wrote at least one work of science utopia or science fiction (e.g., Poe and Hawthorne)	
3. Considerable influence on some leading American thinkers (e.g., John Dewey) has been claimed for works such as Bellamy's Looking Backward, and similar influences have been claimed for foreign writers such as H. G. Wells and Jules Verne	
4. Most fictional (and nonfictional) works advocating social reforms gave science and technology major, and often preponderant, roles in accomplishing those reforms	
C. In the United States during the twentieth century	89, 91, 95, 104, 111
1. Through the first half of the Century, almost no writer of the recognized first rank wrote a science utopia or science fiction story	
2. During the 1920's and 1930's, science fiction was relegated to the pulp magazines—many stories were of poor literary and imaginative quality, and few undertook serious social criticism or satire	95, 104, 106, 114

3. Since the 1940's, many science fiction stories have been of better literary, imaginative, and scientific quality; but they have rarely been utopian, and have rarely been optimistic about man and society	37, 68, 72, 75, 105
4. Since World War II and the atomic bomb, commentaries about science which have appeared in popular media have generally been pessimistic about the future and about science and technology in our society--and this remains generally true of fiction	37, 41, 43, 53, 83, 95
5. In this period of such major influence by science and technology, why has there been relatively little interest in the reflection of these influences in fiction?	
VI. Anti-Utopian Themes of the Mid-Twentieth Century	
A. Theme is usually the juxtaposition of advanced science-based technology (the Baconian dream) with a rigid social control which debases human individuality and dignity	
B. Blame is implicitly laid on man himself--the creators of the technological means for social control are merely the agents of the whole irresponsible society--perhaps man is not a perfectible creature	
C. The anti-utopians are frightened about advanced science and technology--and their further advancement--because of the power they give for the imposition and maintenance of a rigid society	
D. The utopian dream of earlier days, the development of technology which leads to economic freedom for all, has become the anti-utopian dream of today--its realization now seems to imply, or contribute to, the stripping of all other freedoms from man	95, 118
E. Nevertheless, the influence, the need for, and positive aspects of utopian and extrapolative thought continue to be stressed by some writers	15, 97, 105

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LEADING QUESTIONS

1. Are utopian states necessarily "happy" states? Is an "ideal" state necessarily a congenial one or is it rather a perfect example of a specific type of society? Is the neologism "dystopia" a helpful concept?

2. Maddison, Weber, and Walsh find a spirit of disillusionment with the utopian dream in recent Western science fiction. Compare 19th Century American science fiction with recent Soviet science fiction. Are the Soviets still optimistic, or only "officially" so?

3. Many utopias, up to the end of the 19th Century, seem to have depended upon the innate goodness and reasonableness of man to make the ideal society work. Compare with the dystopia of Huxley's Brave New World or the utopia (?)of Skinner's Walden Two. What historical reasons might be advanced for the apparent loss of faith in humanity?

4. Arthur C. Clarke argues that the most common failing of extrapolaters of the future is a lack of appreciation for the rapidity of the advance of science and technology. Do you agree?

5. Much of the feeling of revulsion modern writers display in the face of such "utopian" models as Huxley's Brave New World, Orwell's 1984, or Skinner's Walden Two seems to stem from a feeling that the men of those societies have been alienated from a proper "human" environment. These "nightmares" of the future portray societies of high technology and high administrative and economic efficiency. What went wrong?

6. How does it happen that scientific innovations have often been described in science fiction long before they have become practical realities?

7. To what extent have science utopias been used deliberately for purposes of persuasion or propaganda? Why utopian or fictional presentation instead of straightforward expository writing?

8. Is utopian literature always recognized as utopian--by readers--by authors? What are the reliable tests of utopianism?

9. Does utopian or other fictional literature serve a useful function in public policy analysis and planning? How?

10. Is projection of the future necessarily utopian or fictional? What distinctions may be drawn between future-oriented fiction and conjecture?

TOPIC 08 ESTHETIC EXPERIENCE: CONCEPTS, MEDIA, TECHNIQUES

Science and art have often been contrasted as mutually alien or even antagonistic cultural forces. There is a factual basis for this dichotomy, but there is also evidence of mutual influence and even assistance between art and science. Elements common to artistic and scientific creativity have been identified. Art has expressed the emotional reactions of the sensitive man to interpretations of the natural world derived from the sciences. Most of the great themes or theories of science have been reflected in art, although not always in ways that scientists would recognize. Very little of the work of painters, sculptors, or architects in the 20th Century would be intelligible to viewers who had not been exposed in some degree to the theories of Darwin, Einstein, Freud, or Planck, or to new concepts in engineering, mathematics, or psychology. Science has also contributed materials, tools, and techniques to artistic production and to the identification, analysis, preservation, and restoration of artistic works.

Scientific creativity is itself a form of esthetic expression. There are intuitive aspects of scientific inquiry that are analogous to artistic inspiration. And the highly-developed scientific experiment, hypothesis, or theory is comparable to a work of art. Nevertheless, it may be questioned whether the truths of science and of art are of the same order. The frank subjectivism of the artist can sometimes set up a responsive reverberation in the minds of men that the objectivity of science cannot generate. The artist can sometimes sense the wholeness of things that the scientist can see only in the dissociated context of scientific analysis or reductionism. But science presents a formidable perceptual and intellectual challenge to the artist. Much of the artistic creativity of the present era appears to be the result of efforts to reconcile esthetic perception with technoscientific reality. The relativistic and illusory character of conventional reality has been well enough understood by artists to have made possible the work of Seurat, Mondrian, de Chirico, Picasso, and Dali. Yet photography and other techniques of reproduction are capable of a kind of perfection that representational art cannot match. Science opens new possibilities for artistic experiment--and so we have op art, stochastic music, and functionalism in architecture. It seems probable that much of the unintelligibility characterizing 20th Century art represents premature or unsuccessful efforts to reconcile the feelings and values of the inner man with external realities as described by science.

It is doubtful that the influence of science upon art has approached its potential. As popular understanding of science increases, the embodiment of science-derived perceptions in esthetic expression seems certain to increase. The theology and cosmology of a prescientific age provided the great themes and inspiration of Ancient and Medieval art. The art of the future may find equally evocative themes in the unfolding of the mystery of the natural world as revealed through science.

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TOPIC 08 ESTHETIC EXPERIENCE: CONCEPTS, MEDIA, TECHNIQUES

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1. Functionalism in design and structure	B5, B7, B8, B10
2. Logic of materials and techniques--the skyscraper	B6, B20
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4. Influence of technical concepts and methods	B3, B5, B6
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LEADING QUESTIONS

1. What science-derived concepts make plausible the juxtaposition of steam engines and classical antiquity in the paintings of De Chirico, the dream-like representations of Redon and Miro, and the rigorous parsimony of lines and squares in the advanced style of Mondrian?

2. Why did artistic expression after 1850 tend to become identified with political and social revolution whereas, historically, art has characteristically expressed the values of established order? Was technology a factor?

3. It is alleged that photography marked the end of representational painting and the beginning of several new art forms. How valid is this assertion? What contemporary art forms derive directly from science and technology?

4. The interactions of science and technology and the design arts appear to be strong but unbalanced. Do the technological triumphs of architecture and engineering in the projected uni-structural city or the esthetic impositions of Corbusier or Niemeyer on architectural structure rest upon an adequate understanding of human needs and behavior?

5. If robots can be programmed to paint and computers to compose music, does artistic expression remain a unique aspect of human culture or does it become mere technology, less perfect than that of machines?

6. Certain aspects of science and technology were imagined by artists before, sometimes long before, they became practical realities. Does this suggest that the methods of art and science are not necessarily separate or opposed?

7. Science has demonstrably affected artistic expression. Have the arts had comparable effects upon science? Upon mathematics?

8. Through what specific scientific techniques has the reconstruction of ruined artifacts and monuments been assisted? Have these techniques a significance for art itself, or are they merely operational methods?

9. Are the associations of art with science and technology phenomena of modern times or have there been earlier associations? If there have been prior associations, what has been their nature?

10. Is science responsible for the intellectualizing trend that some critics identify in modern art, music, and poetry? Is there a connection between reductionism in science and tendencies toward abstract and elemental forms in the arts and architecture?

III

SCIENCE, TECHNOLOGY, AND HUMAN VALUES

The third and concluding part of this study guide deals with the influences of science and technology on man's interpretation of the universe and of his place in it. Part III is future-oriented, summarizing the possible roles of science in the continuing evolution of human society. Topic 09: The Ethics of Science and a Science of Ethics is largely self-descriptive. Its content deals with the reciprocal influences of scientific and ethical thought and behavior, and with the controversies that have arisen over the ways in which science affects man's sense of right and wrong. Topic 10: Perspectives on Life: Teleology, Cosmology, Religion relates science to religion and to beliefs concerning human purpose and destiny. And, finally, Topic 11 examines the Prospects for a Practical Science of Human Society. Here a critical consideration is the suitability of the structure of science for the study of man. Have the reductionist and fragmenting tendencies of science obstructed advancement of a comprehensive science of man? Should there be only one comprehensive science of humanity? Or is mankind and his civilizations better understood when approached, as at present, through several discrete sciences or disciplines (e.g., history)? Throughout Part III, and the entire Study Guide, there is an implicit question regarding the limits to man's self-understanding. No definitive answer can be given to this question; but in a world in which humanity presumes to direct the future, consideration of the possibilities, benefits, and costs of knowledge of self and of society is a logical endeavor and one highly relevant to the welfare and survival of humanity.

TOPIC 09 THE ETHICS OF SCIENCE AND A SCIENCE OF ETHICS

Although the term "science" represents an abstract concept, there is a tendency in modern society to treat it as an autonomous force. As a body of man-made method, doctrine, and attitude, science (like any cultural institution) does have an existence independent of any individual scientist. It is therefore possible to consider the ethics of science independently of the conduct of individual scientists. Distinction must be made, however, between the actions of men as scientists and of professional scientists when not engaged in the business of science. Confusion arises when scientists step out of their laboratories and speak as experts in politics, international relations, economics, and religion--fields in which they may have no more (and perhaps less) competence than many non-scientists. Scientists, among others, have given much thought to the values implicit in science and to the ethics to which their work should conform. But discrepancies appear between the conventional ethics of society and what some scientists perceive as higher ethics revealed by scientific knowledge. Some scholars have therefore sought for scientific means to test or to redefine the prevailing ethics of society (e.g., Emerson, 1954).

Does science as a cultural institution have an ethic peculiarly of its own, and is science always subject to the general body of ethical principles prevailing in society? The questions are debatable. But the impact of science on society justifies social concern with whatever ethics govern science and technology. There is ample evidence to suggest that the ethical assumptions of modern society fall short of the guidelines and standards for conduct that would be necessary to prevent science and technology being used in ways that are harmful to mankind and to the planetary ecosystem generally. Responsibility for the ethical use of science therefore transcends the exclusive concern of scientists and becomes a responsibility of the entire society.

Complicating this responsibility is the effect of science in calling into question many tradition-derived ethical assumptions. Among the areas of social and personal ethics affected by scientific information and concepts are: (1) control of human reproduction, (2) alteration of personality, (3) biomedical experimentation and euthanasia, (4) sexual behavior, (5) measurement of intelligence, (6) economic growth and development, (7) criminal justice, (8) distributive justice, and (9) ownership and use of natural resources. Not all sciences, or scientists, share agreed perspectives on these areas. It is nevertheless apparent that knowledge has changed many of man's long-established moral and ethical attitudes. Is it possible that science can be used to test the validity of social ethics? Can science be used to construct a new ethical system in which scientific findings and popular attitudes regarding right and wrong conduct will be based on the same criteria? Efforts thus far made to construct a scientific system of ethics have not achieved success. But it seems probable that the issue will remain active and will gain pertinence as behavioral science continues to uncover the biological and the psychological explanations of human conduct.

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TOPIC 09 THE ETHICS OF SCIENCE AND A SCIENCE OF ETHICS

TOPICAL OUTLINE	REFERENCE KEY
I. Is There An Ethical Content in Science? (Note concern with this question by writers of science fiction, Topic 07)	11, 66, 93, 105, 134, 146, 163
A. Are there ethics specifically belonging to science and distinguishable from other ethical systems?	23, 115, 118
B. To what extent is science bound by general systems of ethics extant in society?	16, 22, 23
C. How does one ascertain the ethics by which science and scientists are guided? (or should be guided?)	39, 49, 83
II. Differences Between Ethical and Scientific Judgments:	26, 39, 81, 94, 134, 146
A. Ethics are normative and prescriptive, science is analytic and descriptive	106, 141, 171
B. Ethical judgments or sentences do not state facts in the scientific sense, because they emphasize normative values (e.g., what ought to be rather than what is)	
C. Ethical propositions express emotions, attitudes or values that are not easily amenable to scientific analysis or validation	
D. Science and ethics therefore differ in their criteria for validity and their canons of truth	24, 74, 130
E. Unlike a validated scientific proposition there can be contradictory ethical systems with no satisfactory means for choosing among them	17
III. Characteristics of Ethical Systems	
A. Expressions of "oughtness" may be taken as the "fact" content of an ethical proposition	

- B. An ethical system is seldom comprehensively articulated, but is deducible from a group of ethical propositions
  1. Formal ethical systems are idealizations, incomplete and often apparently inconsistent in relation to the actual conduct of people ostensibly committed to the respective ideologies 33, 34
  2. Social and individual ethics are usually distinguishable and not necessarily formally consistent (e.g., "taking of life") 5, 6, 7
  3. Attack upon the substance of specific social ethics can easily be perceived to be or indeed actually become an attack upon the fabric of society itself
  4. The free exercise of critical scientific inquiry into ethical attitudes may therefore be hazardous to social beliefs and social integrity

- C. Ethical beliefs and systems thus pose difficult problems for societies that attempt to control science and technology on the basis of values and social goals 9, 10, 76, 160

- D. Amenability of ethical propositions to scientific investigation 130, 154, 171
  1. Naturalism--science may compare statements with events
  2. Nonnaturalism--no basis for scientific comparison
  3. Noncognativism--subjectivism without intellectual content, not substantively amenable to science, but may be studies as phenomena

IV. Can Science Resolve Ethical Problems? 60, 63, 66, 86

- A. Must ethical reasoning start with ethical premises?
  1. The requirement of consistency in an ethical system--an analogue to the logic of science?
  2. The requirement of conformity with observation and with the content of empirical science
  3. Can ethical propositions be deduced from scientific premises? 111

B. Do the results of science imply or require any propositions of ethics? 12, 13, 27, 74
  1. A logical problem: Can one formally deduce or infer an ethical statement from a set of premises that does not contain any ethical statements?
  2. A negative view: science has to do with facts, but ethics are a matter of personal opinion or collective judgment
  3. A positive view: it can be argued that a false dichotomy between ethics and science was created above; science as a body does include ethical statements, so that, logically, deductions and inferences from the body of scientific statements may yield ethical conclusions
  4. Conclusion: even if it were not possible to deduce or infer ethical statements from scientific premises, yet any ethical premise can in principle be assessed by observation and the methods of science

C. Attempts to apply scientific knowledge and methodology to the validation of ethics 29, 45, 52, 89, 90
  1. Naturalistic ethical systems influenced by physical and biological sciences 14
    a. 18th century systems of rationalized ethics and political-economy (e.g., physiocracy, ethocracy
    b. 19th Century "Darwinian" ethics 54, 75
    c. 20th Century biocratic ethics of Cannon, Emerson, and Hardin 29, 80
  2. Social ethics influenced by findings and theories in the social sciences and history 37, 47, 81
    a. "Vox Populi Vox Deo"?
    b. Equalitarian and utilitarian ethics deduced from social theory or behavior 107
    c. Economism as an ethical premise
    d. Marxism as a system of political ethics derived from a "science" of history
  3. Arguments from the logic of science (see Morgan and Miller) 74, 152, 154

V. Can "Good" Scientific Judgments Be Compatible with "Good" Ethical (or Political) Judgments?	11, 12, 154, 171
A. Problems	3, 98
1. Maintenance of the social fabric--the system of values that gives order and cohesiveness to the society	
2. Renewal or restructuring of society when values and beliefs disintegrate partially because of science and technology	
3. Choice of social goals consistent with the central values of the society	
4. Maintenance of the integrity of science	
5. Choice of kinds and levels of support of science and technology	
B. Difficulties	1, 12, 15, 22
1. Lack of ability to assess value priorities quantitatively	91, 94
2. Forecasting effects of advances in science and technology (cf. Topic 07)	
3. Determination of the effects on science and technology of goal-oriented support toward: knowledge for its own sake, national prestige, social or economic development, military purposes, etc.	32, 64
4. Uncertainties regarding individual ability to identify and retain central values and goals in the face of change (e.g., "future shock")	61
5. Who is responsible? Extreme ethical judgments	1, 39, 41, 56, 165
a. Disinterested experimenter--ethically dissociated from the social implications of his work (Frankenstein)	18, 19, 84, 121, 125, 157, 159
b. Altruistic contributor to social and economic progress (Arrowsmith)	
c. Willing agent of man's power to destroy himself (Dr. Strangelove)	
d. Seeker of knowledge regardless of consequences (Faust)	106, 151, 153, 156

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LEADING QUESTIONS

1. Why should the ethics of science, or the effect of science upon ethics, be of concern to students of political behavior or public policy?

2. A recent and widespread view of the meaning of ethical sentences or statements has been the emotive theory, which maintained that ethical utterances are noncognitive (do not convey information, but only express emotion). If true, could scientific observations have any bearing on ethical disagreement?

3. Can a proposition (not an act) that is scientifically valid be ethically "wrong"? Are there ethical norms or "truths" that are scientifically "wrong"? What are the semantic problems involved in those questions?

4. What types of politico-ethical dilemmas are created by scientific findings with respect to: (1) the psychology of individual differences, (2) use of mind- or emotion-affecting drugs, and (3) the phenomenon of death? Is our political system capable of dealing with these problems in the light of scientific knowledge?

5. Can human failure to conform to ethical norms be remedied by revising the norms to correspond more closely to "natural" behavior or by altering human behavior on the basis of scientific understanding so as to conform to the norms?

6. Is "truth" a quality unique to science? What would be the tests of other than scientific truths? Does knowledge of scientific truth help us to determine priorities in social and ethical choice?

7. Does the enormous increase in range and magnitude of scientific and technological capability require a corresponding growth of ethics? Don't we already have all the ethical knowledge that we need?

8. Could science contribute much more to ethical development than it has? Why have the relevant aspects of science received relatively little attention?

9. What changes in academic organization or in the orientation of scientists would be necessary to determine definitely whether a science of ethics were really possible? Why has such a development been neglected in the universities?

10. Is an ethical system viable if it has no religious base? To what source of authority could a nonreligious ethical system have recourse? Relying only on science for guidance, what practical solutions could be found for the following policy areas: (1) race relations, (2) automotive traffic congestion, (3) water pollution, (4) population pressure, and (5) control of economic growth?

TOPIC 10 PERSPECTIVES ON LIFE: TELEOLOGY, COSMOLOGY, RELIGION

"When society commands the means to do almost anything it wants, value judgments of ends are crucial."[1] The very successes of science and technology have brought back to the forum of public policy considerations of goals and values that science and rationalism were believed to have banished. The technoscientific superculture has not undertaken to provide society with a blueprint for its future or a formula for determining what goals should be pursued or what values served. And by implication, but also sometimes directly, it has undercut, or at least opened to question, faith in the validity of the social goals of traditional societies and has treated teleology as a nonscience, of relevance only to the study of mythology or metaphysics. Nevertheless, public questions keep arising in which the uses of science and technology are at issue and for which answers must ultimately depend upon value judgments rather than upon scientific conclusions. Because these value judgments depend upon what men think is important in life, upon criteria for goodness and badness and upon beliefs concerning the destiny of man, it is doubtful if a nation can exercise purposeful control over the use of science and technology if it does not also concern itself with what the state of the world and of man ought to be.

The study of public policy for science and technology must, therefore, ultimately confront questions of purposes and values that are the subject matter of philosphy and religion. Cosmology and theology are not presently considered to be subject matter for public policy studies. Government in the open democratic societies of Western civilization has almost ceased to consider these matters appropriate subjects for public policy action. And yet, where concepts, values, and beliefs concerning man and nature involve cosmological or theological perspectives, the study of public policy for science and technology must take cognizance of them. For these assumptions and attitudes are a part of the context within which policy with respect to science and technology will be made, and they will influence (most often indirectly) the outcome of policy decisions.

Is it a feasible or appropriate concern of public policy to promote the development of a greater degree of cultural integration in society? Or would society be more stable and enduring if cultural diversity were encouraged? Would the public welfare indeed be served and a better foundation for science policy be provided if the gap between traditional and technoscientific culture were narrowed or closed? If a discontinuity between technoscientific and traditional culture is a cause of failures in public policy and action, it would seem that analysis of the extent and consequences of such cultural incongruencies as can be identified would be a significant task for policy studies. Of all the subject matter with which the study of science, technology, and public policy is concerned, this area of inquiry is surely the most advanced in its intellectual and multidisciplinary demands.

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TOPIC 10 PERSPECTIVES ON LIFE: TELEOLOGY, COSMOLOGY, RELIGION

TOPICAL OUTLINE	REFERENCE KEY
I. Primitive Attempts to Comprehend the Universe and Man's Place in It	25, 81, 87, 94, B47, B117
A. The world is full of life	
1. Animism--life in both the organic and inorganic realms	
2. Man a part of a continuous spectrum of life--from stones to gods	
B. The world is full of gods and spirits	
1. Pantheism	
2. Animal worship	
3. Ancestor worship	
C. Man's role as the creator of gods	
D. The functions of ritual	
II. The Great Religions: The Trend Toward the Universal	1, 116, 118
A. Significance of trend from tribal, familial and civic religion toward universalism	
B. Contrasting views of nature in ancient religions	
C. Residual elements of nature worship	
D. Relationship between God and Nature	
1. Universalism of nature and of God	
2. Ubiquity of God in nature	
III. Religions as Alternative to Scientific Explanation	10
A. Cosmogony--the origin of the world	
B. Cosmology--the nature of the world	
1. Structure and functioning of the universe	

2. The nature of the Creator(s)
3. Man's relation to the world and to the Creator(s)

C. Patterns of life--how man ought to live 3
   1. Ethics-taboos-religious commandments
   2. Purposes--now and hereafter
   3. Relationships--social and ecological

IV. The Secularization of Cosmology in Greece 55

A. The early philosophers--Thales, Anaximander, Anaxagorus
   1. Attempts to explain the nature and origin of the world in terms of first principles
   2. First essays toward theories of matter
   3. First essays toward theories of life and evolution

B. Secularization of man's role in the world
   1. Plato--the rational, considered contemplation of the nature of man and of the good life
   2. Aristotle--the systematization of life by reason and analysis--the "golden mean"

C. The rise of science as a scheme for secularizing cosmogony and cosmology
   1. Aristotle--theories of matter, motion, and causation--theories of knowledge
   2. Continuation of the scientific tradition in the ancient world (e.g., Democritus and Leucippus)

V. Reintegration of Scientific Cosmogony and Cosmology into Religion

A. The Dark Ages in Western Europe: loss of ancient knowledge and attitudes of inquiry 28

1. Dominance of faith and dogma 2. Religion as conservator and interpreter of knowledge 3. Apocalyptic vision of medieval Christianity	
B. Advancement of knowledge in the Islamic world and India--its conservation and transmission to the West through Byzantium and Spain	
C. Intellectualization of Western Christianity: philosophy and science become linked to religion 1. Scholasticism 2. Alchemy 3. Medieval Christian theology--a total theory of knowledge 4. Historical persistence of Aristotelian thought	B45, B61, B64, B84, B91
VI. The New Secularization: The Renaissance, the Reformation, and the Scientific Revolution	75, 106, B31, B64, B120
A. Retrieval of ancient science and philosophy through contacts with the Islamic world	
B. Shaking the Roman Church's claim to authoritative knowledge	
C. 1543: Copernicus and Vesalius	
D. The trial of Galileo	6, 57, B89
VII. New Models of Man and the Universe: The Diminution of Man and Society	44, 62, 66, 67, 78, 93, 104, 117, B25, B66
A. The physical model of the skies--from Ptolemy to Copernicus, Kepler, Newton	39

B. The age of the earth—from 6,000 years to billions of years—Buffon, Lyell	
C. The biological nature of man—Descartes, Buffon, Lamarck, Darwin, Mendel	38, B11, B38
D. The concept of an infinite cosmos	
E. Rise of deterministic theories of behavior and of society	23
VIII. The "Warfare" of Science with Theology	32, 36, 77, 90, B26, B48, B121
A. Challenge of science to religious efforts to explain everything	15, 30
B. The modernist—fundamentalist controversies	B67, B69
C. Religious attempts to assimilate the findings and spirit of science	
1. Revisionist theologies consistent with positivistic science	
2. A synthesis of science and religion: problems and prospects	B3, B21, B33
3. Attempts to blend religion and science in a grand cosmological scheme (e.g., Teilhard de Chardin)	12, 16, 121, B32, B112
D. Science and scientism: new faiths?	76
IX. From Newton's Mechanics to Einstein's Relativity	15, 65
A. Interpretations and implications of scientific concepts of relativity and indeterminacy	58
1. Reinterpretations of so-called scientific "law"	
2. Philosophic implications of "randomness" in nature	
B. Impact of evolutionary theories of the cosmos	99

1. Competing concepts of the origins of the Universe	42, 43
2. New meanings of old concepts of time and space a. eternity b. infinity	41, 45, 100, 115
3. Paradox of a boundless but finite universe	
4. Concept of a regenerating and indefinitely expanding universe	
X. Man and the Macrocosmos: The Effect of Cosmology Upon Attitudes Toward Society and Politics	14, 69, 70, 123,
A. Effects of time and space concepts	2
1. Is the universe so disproportionate to human experience as to have no effect on social behavior?	
2. What evidence is there of an effect of cosmology upon relative values?	
3. Who is affected by concepts of the cosmos; what secondary effect, if any, would influence political behavior?	
B. Effect of the probability of life elsewhere in the universe:	8, 26, 39, 47, 51, 53, 60, 119, 127, B35
1. What is the effect, if any, of the possibility that man is neither unique, nor the most intelligent form of life?	
2. What effect does the possibility of alien and pathogenic forms of life have on the control of space exploration?	49
C. Reinforcing effect of cosmology upon the scientific study of religion	B23, B47, B63
1. Comparative religion and textual criticism	
2. Dead Sea Scrolls and the origins of Christianity	
3. Cosmological controversies, scientific and pseudo-scientific	B115, B124

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LEADING QUESTIONS

1. Is cosmic evolution irrelevant to human social needs and values? If so, why do all great religions tacitly or explicitly adopt a cosmology?

2. Has the growth of science changed doctrine in the major religions of European civilization? Has it changed the role of religion in civilization generally?

3. Can scientific methodology be applied to religion or the directing of mankind's future? In what respects? What are the limitations of science in this task?

4. Has science generated a comprehensible cosmology? Have the world religions any future in the area of cosmology? Can science fill the goal-making and pattern-making functions of religion?

5. Bishop Ensley (in Booth, Religion Ponders Science) argues that scientific success sometimes makes religion necessary. Does his position seem justifiable? On what grounds?

6. What does the following statement by Albert Schweitzer suggest regarding the significance of science and cosmology? "All events that occur within nations and within mankind can be traced to spiritual causes contained in the prevailing attitude toward life." (Out of My Life and Thought, Chapter 13)

7. Paul Tillich has written that "space exploration in the democratic world strengthens the anti-democratic elements. . . ." and ". . . it contributes greatly to . . . the growth of esoteric groups who through their knowledge and inventiveness far surpass what can be reached even by highly learned and productive people . . . ." What are the political implications of this viewpoint?

8. What might be the effects upon the sciences of greater reliance upon scientific knowledge for guidance in matters of life-styles and ethics? Specifically, how would the social and behavioral sciences be affected?

9. What are some of the possible implications of exobiology for human welfare, values, and religion?

10. How does the grand evolutionary thesis of Teilhard de Chardin reconcile science and religion?

TOPIC 11 PROSPECTS FOR A PRACTICAL SCIENCE OF HUMAN SOCIETY

Anthropology is a science of man, but it has not developed to include all aspects of human behavior. Although more is now known about man than has ever been known, it is apparent that we are yet a long way from a comprehensive and valid science of mankind or of human society.

Under Topic 01, Changing Views of Man: The Mirror of Science, it was observed that the mirror of science reflects partial and disparate images of man. Knowledge of specific aspects of human behavior exists in depth in particular sciences. But between these sciences there are undeveloped areas in which human behavior is poorly understood. The extent and depth of these areas is not easily surmised. It is obviously difficult to assess the importance of knowledge that one does not possess; and, in the absence of an adequate "blueprint" or description of the total man, it is impossible to estimate the depth or breadth of our ignorance. We can be reasonably sure that there are large areas of ignorance concerning man, because of the large number of questions concerning his behavior that no present science seems able to answer. Some of these questions may be attacked through a broadening or branching out of existing sciences. Other questions can be answered only through cooperation or synthesis among the sciences. If a science of mankind can be created, it would therefore seem that it must be a super-science--embracing most of the social sciences and the humanities and based upon the biological and behavioral sciences.

An essential condition for a science of human society would be a pervasive desire in the universities that such a science be developed. Beyond this there must be social acquiescence, something that is not generally in evidence in any nation in the world today. It would not be easy to demonstrate that man as a species really wishes to understand himself, even though self-understanding has been sought by particular individuals. This general lack of reflectiveness may have been a source of strength in traditional societies, where unquestioning attitudes reinforced social stability. In the technoscientific world, however, this lack of perspective on oneself, and on society, can become as serious a threat to welfare and personal freedom as the possession of dangerous knowledge by unwise individuals.

As scientific knowledge regarding human personality grows, and the means to manipulate it increases, the unreflective man becomes evermore vulnerable to control by those who understand how to manage his behavior. Science has already been enlisted to influence attitudes and actions. Politics and advertising have now become exercises in applied psychology. There is yet no proof that a society made up of autonomous, responsible, self-actualizing individuals is possible. We can only guess at the possibilities for a truly free society in the absence of fuller and more generally diffused knowledge regarding mankind. But we cannot be sure that this knowledge would necessarily result in a happier society.

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TOPIC 11 PROSPECTS FOR A PRACTICAL SCIENCE OF HUMAN SOCIETY

TOPICAL OUTLINE	REFERENCE KEY
I. Why A Practical Science of Human Society?	45,69, 77, 78,104, 118,132, 144,194, 200
A. A means to self-knowledge	
B. A basis for the appraisal and solution of social problems	
C. A response to conditions suggesting the desirability of increased attention to a scientific understanding of the whole man in society	40
1. Apparent growing incidence of social stress	
2. Narrowing margin for error in social and environmental policy decisions	
3. Growing belief that the beneficial advancement of science depends on wise social guidance	
4. Uncertainties regarding the possibilities of transforming the nature of man and society through science	
5. Growing possibilities for the "scientific" manipulation of human behavior (cf. Topic 02)	
D. A basis for guiding the future evolution of humanity	
II. Obstacles To A Science Of Human Society	25, 62, 89, 108, 135
A. Psychological feasibility: Can an organism--man--objectively study his own behavior?	
1. Is man psychologically capable of self-study?	
2. Can cultural barriers to self-knowledge be transcended?	9

    - a. Does culture exist independently of and uncontrolled by organic evolution? 49, 56, 200
    - b. Does science create its own superculture in which self-examination does not threaten "cultural" values?

B. Social acceptance: to what extent will societies tolerate critical examination of themselves?

1. Sources of frequent opposition to scientific appraisal of human behavior 20
    - a. Political ideology
    - b. Religious belief
    - c. Economic interest
    - d. Educational bias
    - e. Social conservatism
2. Social factors encouraging investigation (and criticism) of society
    - a. Socially perceived threats to social welfare and stability (but may also induce repressive behavior)
    - b. Belief in the possibility of increasing human capabilities and productivity (arguments for education, training, psychology of learning, etc.)
    - c. Moral and ethical concern over alleged "social evils"
    - d. Hope of controlling or dominating other individuals, groups, or nations through a superior psycho-technology (cf. Topic 02)

C. Methodological difficulties: Can the complexities of human existence be given a valid synthesized interpretation? 16, 34

1. The problem of conceptualizing the "whole man" through science
    - a. Diversity of specialized approaches among the sciences
    - b. Lack of adequate unifying or connecting principles (e.g., a general systems theory for human behavior; but note the efforts of several "schools" of behavioral theory to advance such theories) 27

c. Formidable complexity of human behavior--man and society as systems within systems within systems	
2. Problems of obtaining a valid perspective on human behavior	124, 126
a. Time, the short span of human life and the distortions of memory	
b. The liabilities of historiography (e.g., biases of priorities, data, interpretations, evaluations)	
c. Social pressures in any era to think "right" thoughts and to provide socially acceptable explanations (e.g., attitudes for and against social or economic equality)	137
d. Distortions of statistics: "*qui numerare incipit errare incipit*"	
e. Foregoing points indicate the fallibility of teleological explanation; the difficulty of verifying man's present position on a trajectory of history	
3. Problems of discriminating between the conditions of action or direct-problem solving research and so-called basic or generalized research	32, 44, 50, 115
a. Problems of distinguishing "basic" and "applied" research similar to those encountered in natural sciences	
b. Action research usually occurs in an environment of contention and dominance of emotional over rational factors	66
c. Policy research occupies an intermediate position between investigation of "principles" and solution of specific "problems"	
d. Action-oriented research especially susceptible to ideological or political bias--its scientific validity is suspect, although its social value *may* be very great	1, 14
e. Need for strong connective relationships between action research and "knowledge" research to safeguard the validity of the first and the relevance of the second	

III. Conditions Conducive to a More Adequate Science of Humanity	144,146, 152,168, 170,194
A. Advancement of basic sciences of life and behavior	
B. Development of interstitial or "cross-breed" sciences drawing upon biological and social sciences	
C. Adaptation of the research environment—universities and funding policies—to encourage synthesizing and multi-disciplinary investigation	
D. Social acceptance of the dependence of human welfare and safety upon the continuing growth of knowledge of self and society	41, 43
1. Historical record suggests that man's beliefs and attitudes have long been sufficiently dangerous to require overt control	
2. More knowledge may, or may not, make the world safer for humanity, but it is required to overcome many existing social problems	
E. Recognition that the advancement of a science or sciences of man *may* follow a pattern and methodology distinctly different in certain respects from those familiar to the natural sciences	
1. Basic methodologies of natural science may be equally valid for social science	
2. Additional preparation and methods may be required for creativity in social research	
a. Discoveries may be less specific and clearly defined than in natural science	
b. Amount of knowledge required, particularly span of knowledge, may be much greater in social sciences	

    - c. Period of maximum creativity of researcher may be much later in social sciences
    - d. Computerization with stored memory and capacity for multiple analyses may be critical factor in advancement of social sciences
  - 3. Reconstituting of relationships among the social and behavioral sciences will be a necessary phase of the development of a science of human society

IV. Limits and Risks of a Practical Science of Human Society 11, 17, 18

- A. Limits of human intelligence
  - 1. Comparative limitations among population
  - 2. Comparative limitations among individuals
  - 3. Limitations encountered in practical application in contrast to theory

- B. Limits of human ability to coordinate and cooperate in societies expanding indefinitely in size and complexity

- C. Limits imposed by the physical world

- D. Risks of advanced practical knowledge of human social behavior
  - 1. Monopolization and tyrannical misuse of knowledge
  - 2. Human despondence, loss of verve
  - 3. Inducement to an exaggerated anthropocentric view of life and and the cosmos

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LEADING QUESTIONS

1. What are some of the tests for the validity of a science (as distinguished from an individual scientific proposition)? How might these tests be applied to the science of human society?

2. What are the principal reasons that a comprehensive science of human society has not developed? What factors might influence such a development in the future?

3. What evidence suggests that science can transcend culture? Does science do this by creating a culture of its own? If so, does this invalidate the proposition that science can transcend culture?

4. What are the principal psychological impediments to the scientific study of man? To what extent are they culturally conditioned?

5. Is the backwardness of the "humanistic" sciences traceable to the difficulty of verifying their data, or is it primarily the result of insufficient attention?

6. Is there a significant difference between quantification and mathematization of social research? (Note in reference to Lewin [Field Theory in Social Science], and distinctions drawn by Cassirer [30-31]) Has confusion between these two methodologies contributed to the misuse of statistics in social science?

7. How is action research in the social sciences distinguished from the advancement of knowledge in the abstract? What relationships are there between these two aspects of inquiry? Is the relationship comparable to so-called pure and applied science?

8. What changes in academic organization would seem to be favorable to the development of a science of human society? Do the proposed sciences of eiconics, ekistics, humanics, zetetics, etc., indicate deficiencies in the present organization of knowledge?

9. Career development fellowships are awarded primarily in the natural sciences. Should they be much more widely available in the social sciences, assuming that the resulting benefits might be greater? What would be the basis for this assumption?

10. Would an advanced science of human society inevitably be "practical" (i.e., applicable to human affairs)?